JET PROPULSION LABORATORY INTEROFFICE MEMORANDUM

August 23, 2005

TO: **David Morris**

FROM: **S. Guduru**

SUBJECT: **Assessment of Deep Space Network (DSN)'s ability to support SELENE under two different scenarios (launch on July 1, 2007 or launch on February 1, 2008).**

As per an email request from Albert Chang dated 12/08/05, RAPS performed a loading study to determine the ability of Deep Space Network to support SELENE assuming two different launch dates.

Mission Requirements

SELENE is an S-band mission and requires 34Beam Wave Guide 1(BWG1) coverage except on the Launch day when it requires a 26M antenna for initial acquisition in addition to 34BWG1 coverage.

The detailed requirements for SELENE are as follows:

PHASE	DATE	Resource Requirement	Comments
Launch (L)	(L-4hr) through (L+8hr)	One 26M and one 34BWG1	At Goldstone (GDS) or Madrid (MAD) depending on the launch date(on July 1,2007 or February 1, 2008).
Launch and Early Operations Phase (LEOP)	L to L+5 days	Continuous	34BWG1
	L+6 to L+9 days	8 hours at GDS and 8 hours at MAD	34BWG1
	L+10to L+12 days	Continuous	34BWG1
	L+13 to L+19 days	8 hours at GDS and 8 hours at MAD	34BWG1
	L+20to L+22 days	Continuous	34BWG1
	L+23 to L+26 days	8 hours at GDS and 8 hours at MAD	34BWG1
	L+27 to L+42 days	Continuous	34BWG1

Assumptions
There are no planned 34M antenna downtimes in 2007 and 2008 during the Launch period in consideration. All 34M DSN resources are available during this period.

DSS-16 (or a Goldstone Acquisition Aid Capability) and DSS-66 will be available for Initial Acquisition.

Analysis
Analysis was accomplished using the FASTER (forecasting and scheduling tool for earth-based resources) forecasting system and the updated mission set database for the August 2005 Resource Allocation Review Board (RARB).

Taking the current load on the different 34 meter subnets (34BWG1, 34BWG2 and 34HEF) into consideration, the requirements for SELENE were input in a manner so as to cause the least impact to the existing network contention. SELENE has less than 7 hours view on average at Goldstone (GDS) and at Madrid (MAD) in week 30 of 2007 and less than 8 hours view in week 9 of 2008. The User Loading Profile is attached at the end of the study for reference.

Although this study considers 26M for initial acquisition, 26M may not be available for initial acquisition as it is being considered for decommissioning. DSS-16 is planned to be decommissioned in January 2006. For details on DSS-46 and DSS-66 decommissioning please refer to the "2005 DSS-66 and 46 Closure Impact Study" posted on RAP Web at http://rapweb.jpl.nasa.gov/studies.html

The ability of the Deep Space Network to support SELENE is analyzed under two different scenarios, assuming two different launch dates.

Scenario 1: Launch on July 1, 2007

Figure 1 shows the supportability for SELENE in 2007 if it launches on July 1, 2007. On average SELENE is over 75% supportable except in weeks 26, 30 and 32 where supportability falls below 70%.

The duration of the Madrid view period is less than 8 hours on launch day, July 1, 2007 (DOY 182) as a result more support will be required at Goldstone and Canberra (CAN). This limitation causes severe contention at DSS-24 and DSS-34.
Supportability on the 34BWG1 is decreased in weeks 26, 27, 30 and 32. In week 26, SELENE is in contention with MRO and Ulysses (ULYS) at DSS-24 and Stereo Ahead (STA) and Stereo Behind (STB) at DSS-34, in week 27 it is in contention with Mars Reconnaissance Orbiter (MRO), STA and STB. In week 30 the combined average view of GDS and MAD is less than 8 hours. There is significant contention on the 34BWG1 subnet in week 30 due to oversubscription at DSS-54 as SELENE has limited GDS view in week 30 and is in contention with MRO, STA, STB, Messenger (MSGR) and

Voyager2 (VGR2). In week 32, SELENE is in contention with PHX LEOP, STA and STB.

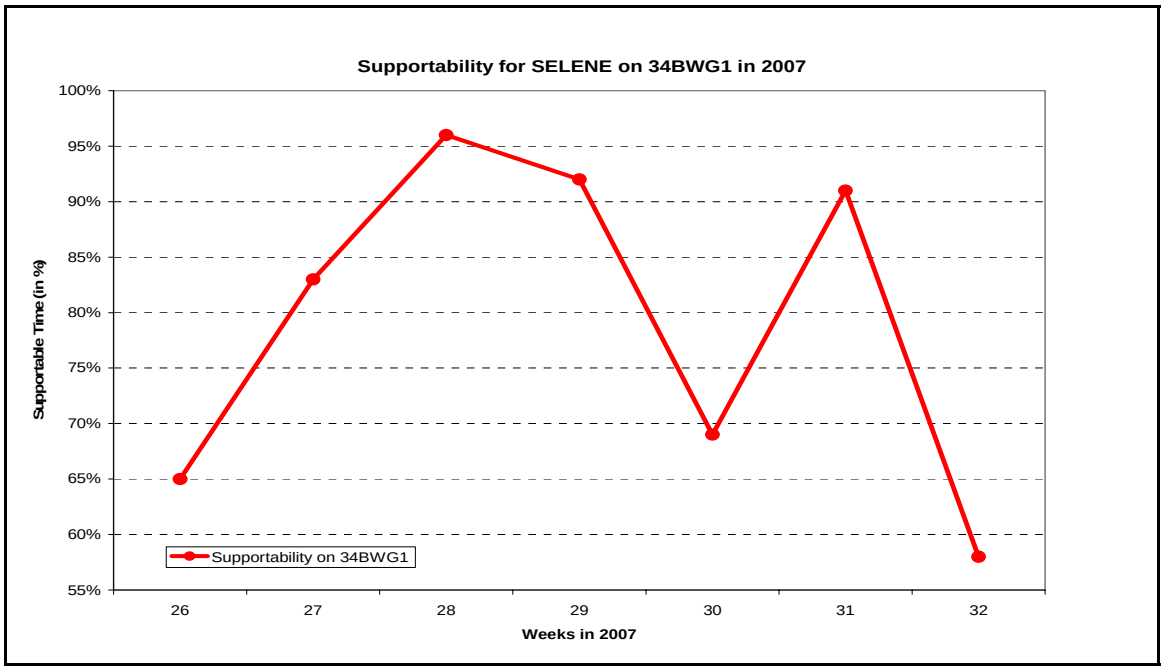

Figure 1

Figure 2 shows the view period overlap of the above mentioned missions with SELENE. SELENE is represented by MOON, STA by Earth Leading Orbit (ELO) and MRO by MAR6 on Figure 2.

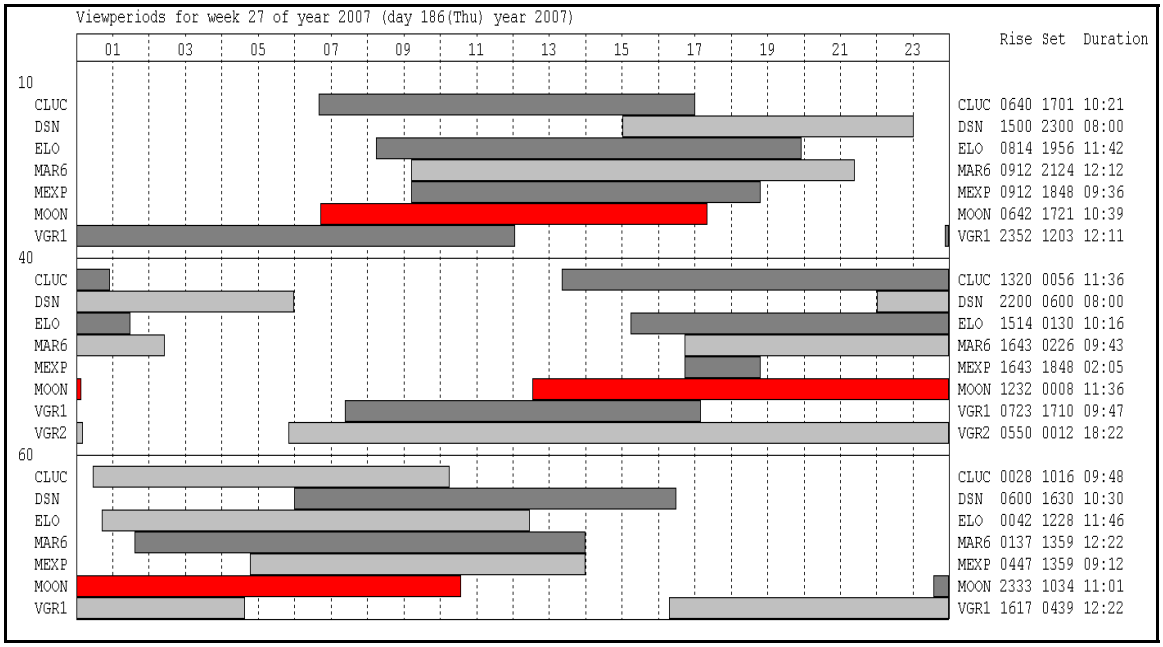

Figure 2

Scenario 2: Launch on February 1, 2008

Figure 3 shows the supportability for SELENE in 2008. On average SELENE is over 90% supportable except in weeks 10 and 11 where support falls below 85%. Contention is with MGS Mapping and Beta Supplement at DSS-34, 54, MSGR Cruise at DSS-54, MRO Prime Science on 34BWG1, Phoenix (PHX) Cruise at DSS-54, STA Prime Science at DSS-34 and ULYS Routine Ops at DSS-24, 54.

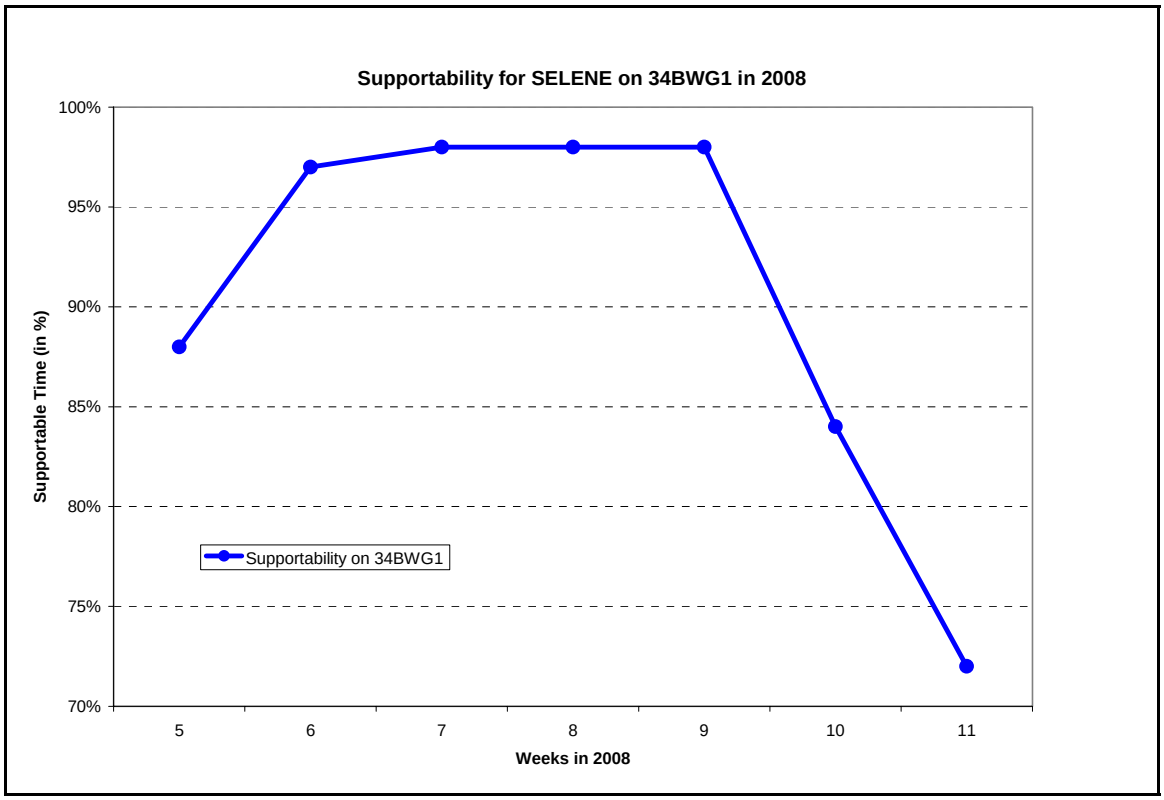

Figure 3

Rebalancing the load on the 34BWG1 subnet by moving MSGR to 34HEF, PHX cruise to 34BWG2 and MRO prime science from 34BWG1 to 34 HEF and 34 BWG2 subnets will increase the supportability for SELENE significantly.

Figure 4 shows the view period overlap of the above mentioned missions with SELENE. SELENE is represented by MOON, STA by Earth Leading Orbit (ELO) and MRO by MAR6 on Figure 4.

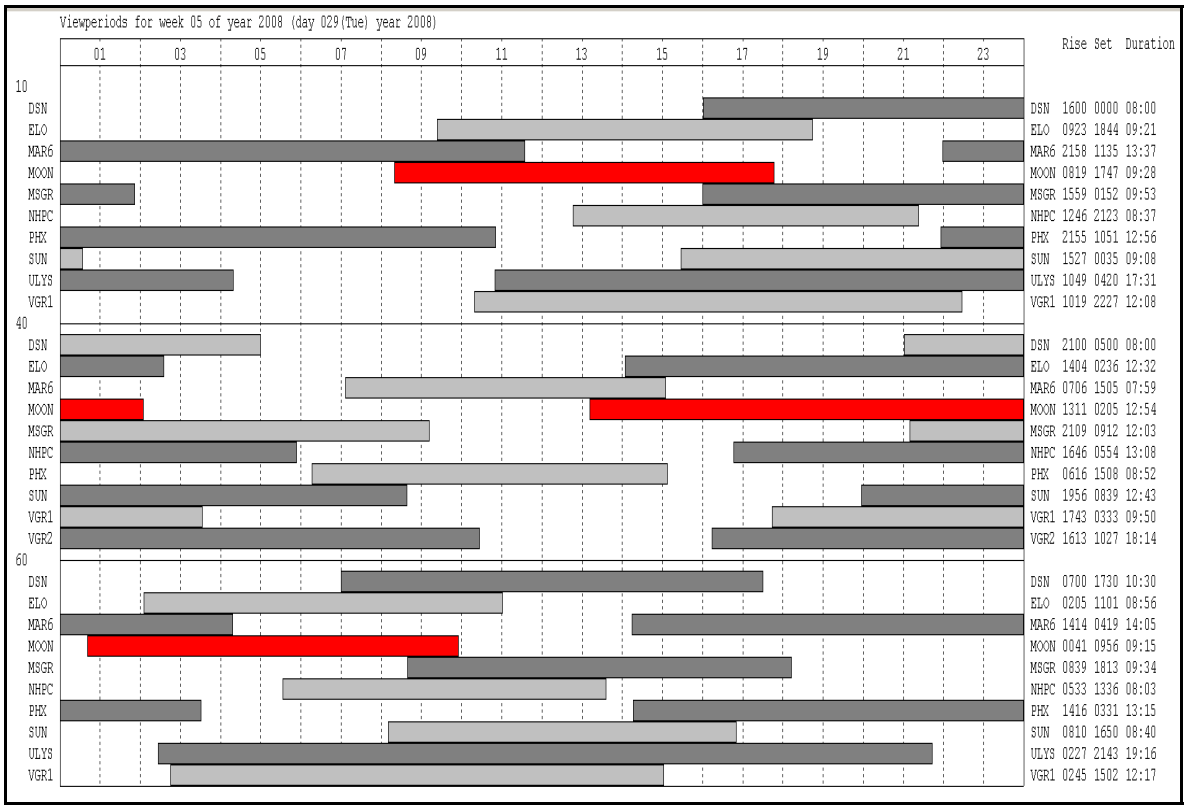

Figure 4

Comparison between Launch Dates

The above analysis shows that SELENE has increased supportability, if it launches on February 1, 2008 in comparison to the July 1, 2007 launch date.

Conclusion

SELENE is above 75% supportable if it launches on July 1, 2007 and above 90% supportable if it launches on February 1, 2008. 26M may not be available for initial acquisition. Alternatives for replacing the acquisition aid capability are being discussed. It is recommended that SELENE launch on February 1, 2008 to avoid contention with PHX Launch and to reduce contention on the oversubscribed 34BWG1 subnet during the DSS-63 approved downtime in 2007.

As always, the results of this study are preliminary in that network loading changes as requirements for planned missions are input and updated. We will continue to work with SELENE and other users of the DSN to maximize the time available for each individual user.

23-Aug-05

User Loading Profiles

Concurrence:

Project Manager Date

SELENE

VP Object	User	Resource	Durations Ave	Min	Calibration Pre	Post	January 1	2	3	4	February 5	6	7	8	March 9	10	11	12	13	14	April 15	16	17	18	May 19	20	21	22	23	June 24	25	26	27	July 28	29	30	31	August 32	33	34	September 35	36	37	38	October 39	40	41	42	43	November 44	45	46	47	48	December 49	50	51	52	53
2007																																																																						
MOON	SELE LAUNCH	DSS-24/16,54/66	8.0	6.0	1.00	0.25																										1																																								
MOON	SELE LAUNCH	DSS-24,34	8.0	6.0	1.00	0.25																										2																																							
MOON	SELE LEOP	DSS-24,54	7.0	6.0	1.00	0.25																																																																							
MOON	SELE LEOP	DSS-24,54	6.0	6.0	1.00	0.25																																																																					
MOON	SELE LEOP	DSS-24,54	8.0	6.0	1.00	0.25																														3			8		10																																	
MOON	SELE LEOP	DSS-24	7.0	6.0	1.00	0.25																																																																					
MOON	SELE LEOP Cont	34B1	8.0	6.0	1.00	0.25																														14			9		6																																	
MOON	SELE LEOP Cont	34B1	8.0	6.0	1.00	0.25																																																																					
MOON	SELE LEOP Cont	DSS-34	7.0	6.0	1.00	0.25																																																																	
MOON	SELE LEOP Cont	DSS-24	10.0	6.0	1.00	0.25																																																																
MOON	SELE LEOP Cont	34B1	8.0	6.0	1.00	0.25																														2						9																															
MOON	SELE LEOP	DSS-54	7.0	6.0	1.00	0.25																																				4																															
MOON	SELE LEOP	DSS-54	6.0	6.0	1.00	0.25																																				1																															
2008																																																																							
MOON	SELE LAUNCH	DSS-24/16,54/66	8.0	6.0	1.00	0.25					1																																																															
MOON	SELE LAUNCH	DSS-24,34	8.0	6.0	1.00	0.25					2																																																											
MOON	SELE LEOP	DSS-24,34,54	7.0	6.0	1.00	0.25									6																																																							
MOON	SELE LEOP	34B1	8.0	6.0	1.00	0.25						4	4	4																																																									
MOON	SELE LEOP	34B1	8.0	6.0	1.00	0.25						4	4	4																																																							
MOON	SELE LEOP Cont	34B1	8.0	6.0	1.00	0.25					6	3	9	9	12	7	9																																																						
MOON	SELE LEOP Cont	34B1	8.0	6.0	1.00	0.25						3				7	6																																																			
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